64516A
Prom Prog. module

64516-90901

HEWLETT PACKARD

SERVICE MANUAL

MODEL 64516A
PROM PROGRAMMER MODULE

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LOGIC SYSTEMS DIVISION
COLORADO SPRINGS, COLORADO, U.S.A.

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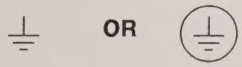
Model 64516A PROM Programmer Manual . . . . . 64516-90901, May 1985

SAFETY SYMBOLS

General Definitions of Safety Symbols Used on Equipment or in Manuals.

Instruction manual symbol: the product is marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.

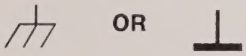
Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must be so marked).



OR

Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.

Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. A terminal marked with this symbol must be connected to ground in the manner described in the installation (operating) manual, and before operating the equipment.



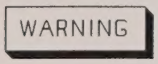
OR

Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.

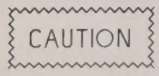
Alternating current (power line).

Direct current (power line).

Alternating or direct current (power line).



The WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed, could result in injury or death to personnel.



The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

NOTE:

The NOTE sign denotes important information. It calls attention to procedure, practice, condition or the like, which is essential to highlight.

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

GROUND THE INSTRUMENT.

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS.

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE.

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of the instrument. Return the instrument to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

DANGEROUS PROCEDURE WARNINGS.

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

WARNING

Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting.

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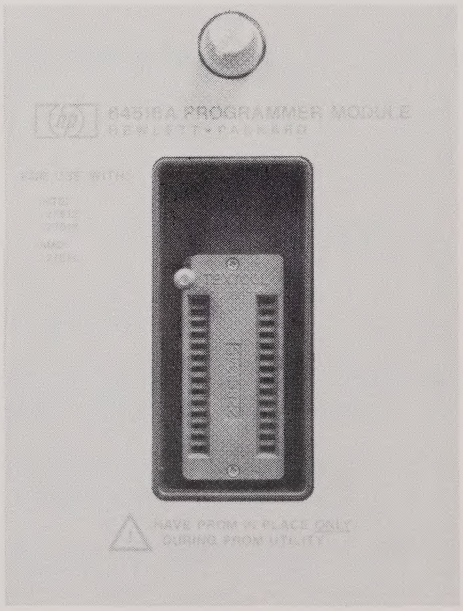

Figure 1-1. Model 64516A PROM Programmer Module

Chapter 1
GENERAL INFORMATION

WHAT DOES THIS SERVICE MANUAL CONTAIN?

This Service Manual contains information required to install and test the Hewlett-Packard Model 64516A PROM Programmer Module. Operating instructions are provided in a separate operating manual supplied with the PROM Programmer Control board. This manual covers the following model number:

Model 64516A . . . . . PROM Programmer Module

SAFETY CONSIDERATIONS TO OBSERVE

This product is a Safety Class 1 instrument (provided with a protective earth terminal) and meets safety standard IEC 348, "Safety Requirements for Electronic Measuring Apparatus"; meets Hewlett-Packard Safety Class I; and has been shipped in a safe condition. The user should review both the instrument and manual for safety markings and instructions before operation. Of particular interest is the " Safety Summary", printed behind the title page of this manual. Additional items of interest are listed below.

WARNING

Do Not Attempt to Disrupt Protective Ground

Any interruption of the power cord protective conductor (third prong of power cord plug) inside or outside the HP 64000 system or disconnection of the protective earth terminal in the power source is likely to make the HP 64000 Logic Development System DANGEROUS! Intentional interruption of the power cord protective conductor is prohibited.

Service and Maintenance - Qualified Personnel Only

Any adjustment, maintenance and repair of the opened instrument may **only** be carried out by **qualified personnel** aware of the **hazards** involved.

Do Not Use If Safety Features Have Been Impaired

If the safety features of the instrument have been damaged or defeated, the instrument shall not be used until repairs are effected which restore the safety features. The safety features of the instrument could be disabled in the following instances:

a. The instrument shows visible damage.

b. The instrument fails to perform correct measurements.

c. The instrument has been shipped or stored under unfavorable environmental conditions. (Refer to Chapter 2 of this manual for information on environmental specifications of storage and shipment.)

HOW IS THIS MANUAL ORGANIZED?

This manual is organized into six chapters.

Chapter 1 contains general information regarding manual applicability, instrument usage, electrical characteristics and equipment requirements.

Chapter 2 explains how to unpack and install the Model 64516A PROM Programmer Module. Furthermore, Chapter 2 gives environmental limits of operation and packing instructions.

Chapter 3 explains performance verification testing and troubleshooting procedures.

Chapter 4 normally contains calibration procedures; however, there are no adjustments for the HP 64516A.

Chapter 5 contains information for ordering a replacement module and other assemblies that are directly replaceable.

Chapter 6 contains instrument and manual change information.

WHAT INSTRUMENTS ARE COVERED BY THIS MANUAL?

The HP 64516A Module is the only instrument fully covered by this manual. The HP 64501A PROM Programmer Control board is part of the PROM programmer subsystem, and is fully covered in its own service manual.

WHAT MANUALS SUPPORT THIS PRODUCT?

The additional manuals supporting the HP 64516A PROM Programmer Subsystem are listed below.

PROM Programmer Operating Manual . . . . . 64500-90912, February 1984
PROM Control Board Service Manual . . . . . 64500-90911, January 1984

DESCRIPTION OF THE MODEL 64516A PROM PROGRAMMER MODULE

The Hewlett-Packard Model 64516A PROM Programmer provides the interface between the Model 64501A PROM Programmer Control board and the PROM being programmed. The Model 64502A will be needed to run operation performance verification.

CAUTION

The Model 64502A Module is the ONLY module that is used to run performance verification! Operating performance verification on the Model 64516A Module may damage the module. Performance verification should never be run on the HP 64516A PROM Programmer Module!

NOTE

The Model 64516A PROM Programmer Module requires Hewlett-Packard Software with a Version number of 1.06 or greater.

By pressing the ***prom_prog*** softkey and then selecting the PROM type to be programmed, the PROM Programmer Utility Screen will appear. This screen shows all the different 645XXA PROM Modules, and the PROMs which they are capable of programming. Use this screen as a handy cross reference.

The Model 64516A Module will program the following PROMs:

AMD 27512

INTEL 27512

INTEL 27513

NOTES

Chapter 2
INSTALLATION

WHAT DOES THIS CHAPTER CONTAIN?

This chapter contains information for installing and removing a Model 64516A PROM Programmer Module from a development station. Included are initial inspection procedures, preparation for use, and instructions for re-packing the instrument for shipment.

INITIAL INSPECTION OF YOUR NEW PROM PROGRAMMER MODULE

WARNING

To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any part of the unit's outer enclosure.

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. Procedures for checking electrical performance (operation performance verification) are given in chapter 3.

If there is mechanical damage or defect, or if the instrument does not pass the Performance Tests, notify the nearest Hewlett-Packard Office. If the shipping container is damaged, or if the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard Office. Keep the shipping materials for the carrier's inspection. The HP Sales/Service Office will arrange for repair or replacement at HP option without waiting for claim settlement.

INSTALLING YOUR NEW MODEL 64516A PROM PROGRAMMER

The Model 64516A PROM Programmer Module must be connected to the Model 64501A PROM Programmer Control board. The Model 64501A Control board must be installed into the development station. See Figure 2-1.

The preferred slot for the Model 64501A Control Card is the front-most slot or the second front-most slot if the Model 64941A Floppy Control board is installed. This allows proper cabling of the floppy control and PROM programmer control boards.

NOTE

Installation of a PROM programmer system in the HP 64110A Development Station is not possible; the necessary voltages are not present in the power supply.

A 50-pin ribbon cable (HP P/N 8120-4336) connects the Model 64501A PROM Programmer Control board to the Model 64516A Module. See figure 2-1.

The cable end with the single connector is connected to the Model 64501A PROM Control board; and the end with the double connector is connected to the HP 64516A PROM Programmer Module.

The cable should be routed across the top of the cardcage and down behind the front panel such that the two connectors are visible in the opening for the programmer module.

Connect the cable to the PROM Programmer Module using the extreme end of the double connectors. See figure 2-2.

NOTE

The PROM Programmer cable connectors are keyed. Because of the keying, they will only fit one way.

CAUTION

To prevent possible circuit damage to the PROM Programmer and/or PROM Programmer Control board, turn the development station power OFF before installing or removing the PROM Programmer Module and/or PROM Programmer Control board.

Figure 2-1. Installation of the HP 64501A PROM Programmer Control Board

Figure 2-2. Installation of the HP 64516A PROM Programmer Module

OPERATING ENVIRONMENT SPECIFICATIONS

The HP 64516A and HP 64501A may be operated in environments within the following limits:

Temperature	0° to 40° C
Humidity	5% to 80% relative humidity
Altitude	4 600 m (15 000 ft)

It should be protected from temperature extremes which could cause condensation within the instrument.

STORAGE AND SHIPMENT

Storage and Shipment Environment Specifications

The HP 64516A/64501A may be stored or shipped in environments within the following limits:

Temperature	-40° to 75° C
Humidity	5% to 80% relative humidity
Altitude	15 000 m (50 000 ft)

Original Packaging Materials

Containers and packing materials identical to those used in factory packaging are available through Hewlett-Packard offices.

Other Packaging Materials

The following general instructions should be used for re-packing with commercially available materials:

a. Wrap the 64516A PROM Programmer Module in heavy paper or plastic.

b. Use a strong shipping container. A double-wall carton made of 350-pound test material is adequate.

c. Use a layer of shock-absorbing material 70 to 100 mm (3 to 4 inches) thick around all sides of the components to provide firm cushioning and prevent movement inside the container.

d. Seal shipping container securely.

e. Mark shipping container FRAGILE to ensure careful handling.

f. In any correspondence, refer to instrument by model number.

Chapter 3
PERFORMANCE VERIFICATION AND TROUBLESHOOTING

WHAT DOES THIS CHAPTER CONTAIN?

Chapter 3 contains information on initiating performance verification to determine if the HP 64516A PROM Programmer Module, or the HP 64501A PROM Programmer Control board has failed. A HP 64502A PROM Programmer Module is necessary to run performance verification.

WARNING

Before the instrument is turned on, any extension cords, and devices connecting to it should be connected to a protective earth ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in personal injury.

CAUTION

The Model 64502A PROM Module is the ONLY module that is compatable with the performance verification test! Running performance verification on the Model 64516A PROM Programmer Module may damage the module. Only perform performance verification on the HP 64502A Module.

If your HP 64516A PROM Programmer Module fails, it is considered a throw away component. If the HP 64501A PROM Programmer Control board fails, it is available through the Hewlett-Packard Corporate Parts Center by Bluestripe Exchange. Troubleshooting is structured to help you determine whether the Model 64516A has failed through performing performance verification on the Model 64502A PROM Programmer Module (THE ONLY MODULE CAPABLE OF RUNNING PERFORMANCE VERIFICATION).

PERFORMANCE VERIFICATION (PV) BACKGROUND INFORMATION

In a HP 64000 system that is either networked (hard disk based) or stand-alone (floppy disk based), the performance verification (PV) software for the HP 64502A PROM Programmer Module and the HP 64501A PROM Programmer Control board is a subset of the option_test PV. Option_test PV tests all possible option modules that can be configured in the HP 64100A cardcage.

The following procedures explain how to run performance verification on the HP 64501A/64502A PROM Programmer subsystem for both a networked and a stand-alone configuration.

Hardware Configuration Needed to Perform PV Testing

The hardware needed to run the HP 64501A/64502A Performance Verification tests is:

HP 64502A PROM Programmer Module
HP 64501A PROM Programmer Control board

Software Configuration Needed to Perform PV Testing

If the HP 64000 system is configured to be a stand-alone system (floppy disk based), then the following software modules must be contained on the local mini disc system (on the mini disc which is inserted into the 64000 mini disc drive 0 or 1):

FLOPPY_OP_SYS
OPTION_TEST
PV_PROM_PROG

Other software modules will be necessary to perform system functions other than HP 64501A/64502A Performance Verification.

If the HP 64000 is in a system configuration (hard disc based), then the following software modules must be loaded onto the hard disc:

OPTION_TEST
PV_PROM_PROG

PROCEDURE TO RUN PERFORMANCE VERIFICATION

The following procedure describes how to run performance verification. Performance verification will test the operation of the HP 64501A PROM Programmer Control board through the HP 64502A PROM Programmer Module. For convenience, figures 3-1 and 3-2 will show in order each screen that will appear on the HP 64000 display as the performance verification procedure below is followed.

For an explanation of each performance verification softkey used during performance Verification, refer to the "PV Softkey Descriptions" following this procedure.

In order to run HP 64501A Performance Verification, the following criteria must be met:

The HP 64501A PROM Programmer Control board must be connected to the HP 64502A PROM Programmer Module.

The HP 64501 PROM Programmer Control board must be installed into the HP 64000 Development Station.

See chapter 2 for complete installation procedures.

Procedure to Perform the HP 64501A/64502A Performance Verification

NOTE

If a PROM programming failure is apparent (i.e., you can not successfully program or verify a particular PROM chip), try programming several new PROM chips before performing the following procedure **(time saver).**

a. Turn ON the HP 64000 Development Station. The "STATUS: Awaiting command" screen should appear.

b. Press the ---*ETC*--- softkey until the *opt_test* softkey appears.

c. With the operating system initialized and awaiting a command, use the *opt_test* softkey or manually type the lower case command:

option_test followed by (RETURN)

The performance verification will now display a directory of the installed option boards and their card slot positions. See figure 3-1.

d. Locate the PROM Programmer (ID # 1000H) and enter the card slot number.

For example, in figure 3-1 the HP 64501A PROM Programmer Control board is in card slot 1. Therefore, enter:

1 followed by (RETURN)

The performance verification test display, figure 3-2, shows the tests which will be executed.

e. Press the *cycle* softkey to execute the tests.

Note the Supply Adjust test. This test will not be executed. The procedure that uses the Supply Adjust test is found in the HP 64501A PROM Programmer Control board service manual.

Each test category is executed and the results are displayed. A complete cycle requires approximately 1 second. To stop the testing, press the *cycle* softkey again or the *end* softkey.

f. When the tests are complete, examine the # Fail colomn.

When all entries are zero, it indicates that 85% of the circuit nodes have been checked and no errors have been found.

To test 99% of the circuit nodes, the Supply Adjust test must also be performed. **Only qualified service personel should perform this procedure!** This procedure is described in the HP 64501A PROM Programmer Control board service manual.

Procedure to Perform the HP 64501A/64502A Performance Verification (Cont'd)

A non-zero value indicates that a subtest failure was detected in that test category.

If all the performance verification tests pass, then the HP 64501A PROM Programmer Control board is operating. This indicates that since the HP 64501A PROM Programmer Control board is operating with a HP 64502A Module, the failure lies with the HP 64516A PROM Programmer Module.

Before discarding the HP 64516A, test it again with some new PROMS. Occasionally a bad PROM or batch of PROMs can make you believe it is the PROM programmer that has failed when it is only a defective PROM.

h. To terminate execution of performance verification testing, while in the performance verification test display, press the *end* softkey. This returns you to the option_test Performance Verification card cage listing. Press the *end* softkey aqain to return to the main display.

CAUTION

The proper operation of the positive PROM programmer requires that a PROM be inserted ONLY AFTER the PROM programmer software module is called, and the PROM be REMOVED before the PROM programmer software module is exited.

NOTE

The PROM software module is called by pressing the *prom_prog* softkey followed by the RETURN key. To exit the PROM programmer software module, press the *end* softkey followed by the RETURN key.

PERFORMANCE VERIFICATION (PV) SOFTKEY DESCRIPTIONS

If further information is needed about results of each test, or you wish to execute only an individual test repeatedly, then softkeys must be used to bring up the appropriate test display and begin test execution. The softkeys have the following actions:

[cycle]	Causes the Performance Verification software to execute each test on the display in turn; the inverse video bar will highlight each test as the test is executed.
[disp_test]	When this softkey is pressed, the subtest display for the test highlighted by the inverse video bar is put on screen. This subtest display shows the status information of the subtest.
[end]	This softkey, when pressed at the Performance Verification overview level, causes the testing to terminate at the end of the current cycle and return to the option_test card slot listing. When *[end]* is pressed at this level, the performance verification software is exited entirely and the system is returned to the awaiting command status.
[exit_test]	This softkey, when pressed in the subtest display level, ends test execution at the end of the current cycle and returns the Performance Verification software to the next higher test level.
[next_test]	Causes the inverse video bar to move to and highlight the next test name on the test display.
[option_test]	Causes the operating system to load the Performance Verification software and begin execution; the option_test card slot listing is displayed.
[print]	Causes all the information above the status line on the current test display to be copied to the system printer, if one is connected. The copy will not be done until the end of the current test cycle, if testing is in progress.
<SLOT #>	Pressing this softkey while in the option_test card slot listing causes the system to prompt you for the slot number of the option board you wish to test.
[start]	Begins repeated execution of the test highlighted by the inverse video bar.

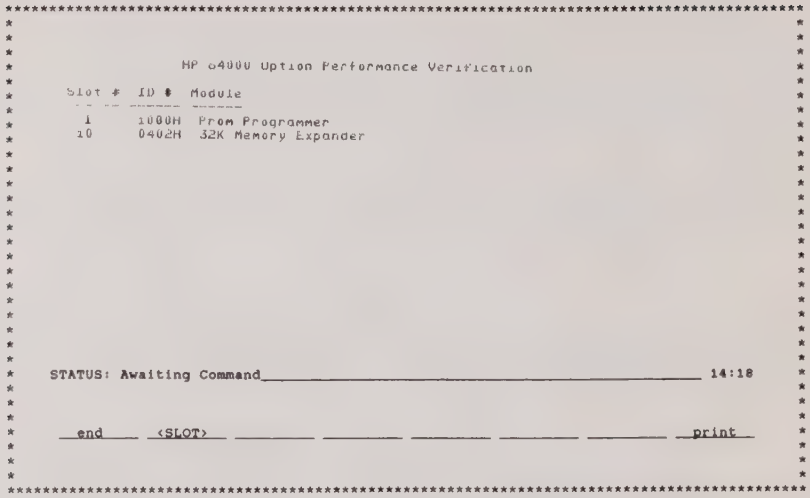

Figure 3-1. Option Test Awaiting Command

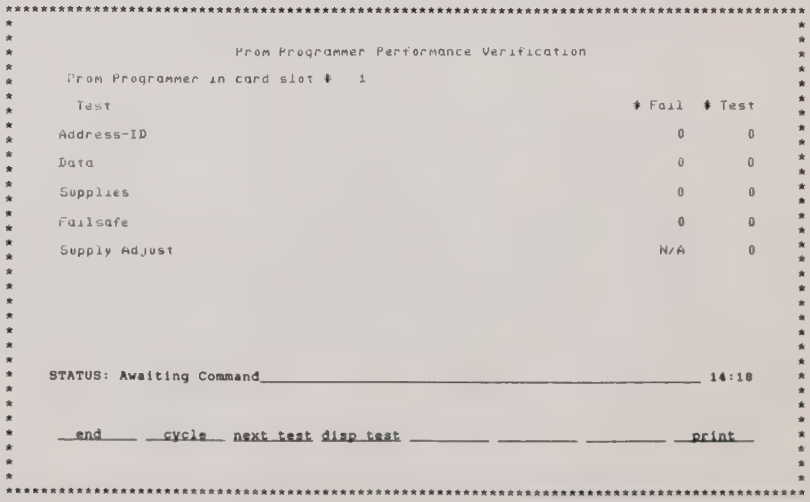

Figure 3-2. PROM Programmer Performance Verification

Chapter 4
ADJUSTMENTS

WHAT DOES THIS CHAPTER CONTAIN?

This chapter normally contains adjustment procedures. The Model 64516A PROM Programmer Module has no adjustments.

NOTES

Chapter 5
REPLACEABLE PARTS

WHAT DOES THIS CHAPTER CONTAIN?

This chapter contains information for ordering parts. Table 5-1 lists the abbreviations used in the parts list and throughout the manual. Table 5-2 list all replaceable parts in reference designator order.

WHAT ARE EXCHANGE ASSEMBLIES?

The Model 64516A is a throw away module. A new module is available through Hewlett-Packard Corporate Parts Center.

ABBREVIATIONS USED IN THIS MANUAL

Table 5-1 lists abbreviations used in the parts list and throughout the manual. In some cases, two forms of the abbreviation are used: one all in capital letters, and one partial or no capitals. This occurs because the abbreviations in the parts list are always capitals. However, in the other parts of the manual, other abbreviation forms are used with both lowercase and uppercase letters.

REPLACEABLE PARTS LIST

Table 5-2 list replaceable parts and is organized as outlined below:

a. Chassis--mounted parts in alphanumerical order by reference designation.

b. Electrical assemblies and their components in alphanumerical order by reference designation.

c. Miscellaneous parts.

The information given for each part consists of the following:

a. The Hewlett-Packard part number and the check digit.

b. The total quantity (Qty) in the instrument.

c. The description of the part.

The total quantity for each part is given only once--at the first appearance of the part number in the list.

ORDERING INFORMATION

To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number and check digit, indicate the quantity required, and address the order to the nearest Hewlett-Packard Office.

To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument repair number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard Office.

DIRECT MAIL ORDER SYSTEM

Within the USA, Hewlett-Packard can supply parts through a direct mail order system. Advantages of using the system are as follows:

a. Direct ordering and shipment from the HP Parts Center in Mountain View, California.

b. No maximum or minimum on any mail order (there is a minimum order amount, for parts ordered through a local HP office when the orders require billing and invoicing).

c. Prepaid transportation (there is a small handling charge for each order).

d. No invoices--to provide these advantages, a check or money order must accompany each order.

Mail-order forms and specific ordering information are available through your local HP office. Addresses and phone numbers are located at the back of this manual.

Table 5-1. Reference Designators and Abbreviations

REFERENCE DESIGNATORS

A	assembly	F	= fuse	MP	mechanical part	U	= integrated circuit
B	= motor	FL	= filter	P	plug	V	= vacuum, tube, neon bulb, photocell, etc
BT	= battery	IC	integrated circuit	Q	= transistor		
C	capacitor	J	= jack	R	resistor	VR	= voltage regulator
CP	= coupler	K	= relay	RT	= thermistor	W	= cable
CR	= diode	L	= inductor	S	switch	X	= socket
DL	= delay line	LS	loud speaker	T	transformer	Y	= crystal
DS	= device signaling (lamp)	M	meter	TB	= terminal board	Z	= tuned cavity network
E	misc electronic part	MK	microphone	TP	= test point		

ABBREVIATIONS

A	amperes	H	henries	N/O	= normally open	RMO	= rack mount only
AFC	automatic frequency control	HDW	hardware	NOM	nominal	RMS	root-mean square
AMPL	amplifier	HEX	hexagonal	NPO	negative positive zero (zero temperature coefficient)	RWV	reverse working voltage
BFO	beat frequency oscillator	HG	mercury				
BE CU	= beryllium copper	HR	hour(s)				
BH	binder head	HZ	= hertz	NPN	negative-positive-negative	S-B	= slow-blow
BP	bandpass			NRFR	= not recommended for field replacement	SCR	screw
BRS	= brass	IF	= intermediate freq			SE	selenium
BWO	backward wave oscillator	IMPG	impregnated	NSR	= not separately replaceable	SECT	section(s)
		INCD	= incandescent			SEMICON	semiconductor
CCW	= counter-clockwise	INCL	include(s)			SI	silicon
CER	ceramic	INS	insulation(ed)	OBD	= order by description	SIL	silver
CMO	= cabinet mount only	INT	= internal	OH	oval head	SL	slide
COEF	coeficient			OX	= oxide	SPG	spring
COM	common	K	kilo=1000			SPL	= special
COMP	composition					SST	stainless steel
COMPL	complete	LH	left hand	P	peak	SR	split ring
CONN	= connector	LIN	linear taper	PC	printed circuit	STL	steel
CP	= cadmium plate	LK WASH	lock washer	PF	= picofarads = 10^{-12} farads	TA	= tantalum
CRT	cathode-ray tube	LOG	logarithmic taper			TD	time delay
CW	= clockwise	LPF	low pass filter	PH BRZ	phosphor bronze	TGL	toggle
				PHL	= phillips	THD	thread
DEPC	deposited carbon	M	= milli=10^{-3}	PIV	peak inverse voltage	TI	titanium
DR	= drive	MEG	= meg=10^{6}	PNP	positive-negative-positive	TOL	tolerance
		MET FLM	= metal film			TRIM	= trimmer
ELECT	electrolytic	MET OX	metallic oxide	P/O	= part of	TWT	= traveling wave tube
ENCAP	encapsulated	MFR	manufacturer	POLY	= polystyrene		
EXT	= external	MHZ	mega hertz	PORC	= porcelain	U	micro=10^{-6}
		MINAT	= miniature	POS	= position(s)		
F	farads	MOM	momentary	POT	potentiometer	VAR	variable
FH	flat head	MOS	= metal oxide substrate	PP	= peak-to-peak	VDCW	dc working volts
FIL H	fillister head	MTG	= mounting	PT	point	W/	with
FXD	= fixed	MY	= "mylar"	PWV	peak working voltage	W	watts
						WIV	working inverse voltage
G	= giga (10^{9})	N	= nano (10^{-9})	RECT	rectifier		
GE	germanium	N/C	normally closed	RF	radio frequency	WW	wirewound
GL	= glass	NE	neon	RH	round head or right hand	W/O	without
GRD	= grounded	NI PL	= nickel plate				

The PROM Cable is not part of the Model 64516A PROM Programmer Module.

The PROM Cable is a part of the 64500S PROM Programmer Subsystem.

Figure 5-1. Model 64516A PROM Programmer Module Being Installed

Table 5-2. Replaceable Parts

REFERENCE DESIGNATOR	HP PART NUMBER	CD	QTY	DESCRIPTION
A1	64516A	5	1	PROM PROGRAMMER MODULE

NOTES

Chapter 6
INSTRUMENT AND MANUAL CHANGES

WHAT DOES THIS CHAPTER CONTAIN?

This chapter normally contains information required to backdate the manual to earlier versions of the instrument. Since the manual applies directly to the only version of the Model 64516A existing, no backdating information is necessary.

NOTES

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Telex: 0712816 HP ULM-D
A,C,E*

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Tel: (0911) 5205-0
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CH,CM,E,M,P

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Geschäftsstelle
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A,CH,CM,E,M,P

GREAT BRITAIN

See United Kingdom

SALES & SUPPORT OFFICES
Arranged alphabetically by country

GREECE
Hewlett-Packard A.E.
178, Kifissias Avenue
6th Floor
Halandri-**ATHENS**
Greece
Tel: 6471673, 6471543, 6472971
A,CH,CM**,CS**,E,M,P

Kostas Karaynnis S.A.
8 Omirou Street
***ATHENS** 133*
Tel: 32 30 303, 32 37 371
Telex: 215962 RKAR GR
A,CH,CM,CS,E,M,P

PLAISIO S.A.
Eliopoulos Brohers Ltd.
11854
ATHENS
Tel: 34-51-911
Telex: 216286
P

GUATEMALA
IPESA
Avenida Reforma 3-48, Zona 9
GUATEMALA CITY
Tel: 316627, 314786
Telex: 4192 TELTRO GU
A,CH,CM,CS,E,M,P

HONG KONG
Hewlett-Packard Hong Kong, Ltd.
G.P.O. Box 795
5th Floor, Sun Hung Kai Centre
30 Harbour Road
HONG KONG
Tel: 5-8323211
Telex: 66678 HEWPA HX
Cable: HEWPACK HONG KONG
E,CH,CS,P

CET Ltd.
10th Floor, Hua Asia
Bldg. Gloucester
64-66 Gloulester Road
HONG KONG
Tel: (5) 200922
Telex: 85148 CET HX
CM

Schmidt & Co. (Hong Kong) Ltd.
18th Floor, Great Eagle Centre
23 Harbour Road, Wanchai
HONG KONG
Tel: 5-8330222
Telex: 74766 SCHMC HX
A,M

ICELAND
Elding Trading Company Inc.
Hafnarnvoli-Tryggvagotu
P.O. Box 895
*IS-***REYKJAVIK**
Tel: 1-58-20, 1-63-03
M

INDIA
Computer products are sold through Blue Star Ltd.All computer repairs and maintenance service is done through Computer Maintenance Corp.

Blue Star Ltd.
Sabri Complex II Floor
24 Residency Rd.
BANGALORE *560 025*
Tel: 55660
Telex: 0845-430
Cable: BLUESTAR
A,CH,CM,CS*,E*

Blue Star Ltd.
Band Box House
Prabhadevi
BOMBAY *400 025*
Tel: 422-3101
Telex: 011-3751
Cable: BLUESTAR
A,M

Blue Star Ltd.
Sahas
414/2 Vir Savarkar Marg
Prabhadevi
BOMBAY *400 025*
Tel: 422-6155
Telex: 011-71193
Cable: FROSTBLUE
A,CH,CM,CS*,E,M*

Blue Star Ltd.
Kalyan, 19 Vishwas Colony
Alkapuri, **BORODA,** *390 005*
Tel: 65235
Cable: BLUE STAR
A

Blue Star Ltd.
7 Hare Street
***CALCUTTA** 700 001*
Tel: 12-01-31
Telex: 021-7655
Cable: BLUESTAR
A,M

Blue Star Ltd.
133 Kodambakkam High Road
MADRAS *600 034*
Tel: 82057
Telex: 041-379
Cable: BLUESTAR
A,M

Blue Star Ltd.
Bhandari House, 7th/8th Floors
91 Nehru Place
NEW DELHI *110 024*
Tel: 682547
Telex: 031-2463
Cable: BLUESTAR
A,CH,CM,CS*,E,M*

Blue Star Ltd.
15/16:C Wellesley Rd.
PUNE *411 011*
Tel: 22775
Cable: BLUE STAR
A

Blue Star Ltd.
2-2-47/1108 Bolarum Rd.
SECUNDERABAD *500 003*
Tel: 72057
Telex: 0155-459
Cable: BLUEFROST
A,E

Blue Star Ltd.
T.C. 7/603 Poornima
Maruthankuzhi
TRIVANDRUM *695 013*
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR
E

Computer Maintenance Corporation Ltd.
115, Sarojini Devi Road
SECUNDERABAD *500 003*
Tel: 310-184, 345-774
Telex: 031-2960
*CH***

INDONESIA
BERCA Indonesia P.T.
P.O.Box 496/Jkt.
Jl. Abdul Muis 62
JAKARTA
Tel: 21-373009
Telex: 46748 BERSAL IA
Cable: BERSAL JAKARTA
P

BERCA Indonesia P.T.
P.O.Box 2497/Jkt
Antara Bldg., 17th Floor
Jl. Medan Merdeka Selatan 17
JAKARTA-PUSAT
Tel: 21-344-181
Telex: BERSAL IA
A,CS,E,M

BERCA Indonesia P.T.
P.O. Box 174/SBY.
Jl. Kutei No. 11
SURABAYA
Tel: 68172
Telex: 31146 BERSAL SB
Cable: BERSAL-SURABAYA
A,E,M,P*

IRAQ
Hewlett-Packard Trading S.A.
Service Operation
Al Mansoor City 9B/3/7
BAGHDAD
Tel: 551-49-73
Telex: 212-455 HEPAIRAQ IK
CH,CS

IRELAND
Hewlett-Packard Ireland Ltd.
82/83 Lower Leeson Street
DUBLIN 2
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A,CH,CM,CS,E,M,P

Cardiac Services Ltd.
Kilmore Road
Artane
DUBLIN *5*
Tel: (01) 351820
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M

ISRAEL
Eldan Electronic Instrument Ltd.
P.O.Box 1270
JERUSALEM *91000*
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Telex: 25231 AB/PAKRD IL
A,M

Computation and Measurement
Systems (CMS) Ltd.
11 Masad Street
67060
TEL-AVIV
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Telex: 33569 Motil IL
CH,CM,CS,E,P

ITALY
Hewlett-Packard Italiana S.p.A
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I-70124 **BARI**
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I-40132 **BOLOGNA**
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CH,CS,E,M

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CH

Hewlett-Packard Italiana S.p.A.
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I-20063 **CERNUSCO SUL NAVIGLIO**
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I-20090 **TREZZANO SUL NAVIGLIO**
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CH,CS

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E,C

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I-35128 **PADOVA**
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A,CH,CS,E,M

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E,CH,CS

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Daiichi Seimei Bldg.
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CH,CM,E

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Scientific and Medical Supplies Co.
P.O. Box 1387
AMMAN
Tel: 24907, 39907
Telex: 21456 SABCO JO
CH,E,M,P

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ADCOM Ltd., Inc., Kenya
P.O.Box 30070
NAIROBI
Tel: 331955
Telex: 22639
E,M

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Samsung Hewlett-Packard Co. Ltd.
12 Fl. Kinam Bldg.
San 75-31, Yeoksam-Dong
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Yeongdong P.O. Box 72
SEOUL
Tel: 555-7555, 555-5447
Telex: K27364 SAMSAN
A,CH,CM,CS,E,M,P

KUWAIT

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SAFAT
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Telex: 22481 AREEG KT
Cable: VISCOUNT
E,M,A

Photo & Cine Equipment
P.O. Box 270
SAFAT
Tel: 2445111
Telex: 22247 MATIN KT
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P

W.J. Towell Computer Services
P.O. Box 75
SAFAT
Tel: 2462640/1
Telex: 30336 TOWELL KT
C

LEBANON

Computer Information Systems
P.O. Box 11-6274
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Telex: 42309
C,E,M,P

LUXEMBOURG

Hewlett-Packard Belgium S.A./N.V.
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B-1200 **BRUSSELS**
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23/4 Pending Road
Kuching, **SARAWAK**
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Telex: MA 70904 PROMAL
Cable: PROTELENG
A,E,M

MALTA

Philip Toledo Ltd.
Notabile Rd.
MRIEHEL
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Telex: Media MW 649
E,P,M

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Municipio de Garza Garciá
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Telex: 038 410
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Equipos Cientificos de Occidente, S.A.
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GUADALAJARA
Tel: 21-66-91
Telex: 0684186 ECOME
A

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Despacho 2001
Colonia Del Valle
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A

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Dolbeau
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CASABLANCA
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Telex: 23051, 22822
E

Gerep
2 rue d'Agadir
Boite Postale 156
CASABLANCA
Tel: 272093, 272095
Telex: 23 739
P

Sema-Maroc
Rue Lapebie
CASABLANCA
Tel: 26.09.80
CH,CS,P

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Hewlett-Packard Nederland B.V.
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NL1180 AR **AMSTELVEEN**
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Telex: 13 216 HEPA NL
A,CH,CM,CS,E,M,P

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Bongerd 2
NL 2906VK **CAPELLE A/D IJSSEL**
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NL 2900AA **CAPELLE A/D IJSSEL**
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Telex: 21261 HEPAC NL
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Hewlett-Packard Nederland B.V.
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NL 5612 LV **EINDHOVEN**
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Telex: 51484 hepae nl
A,CH**,E,M

SALES & SUPPORT OFFICES

Arranged alphabetically by country

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CH,CS,CM,E,P*

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, **WELLINGTON 3**
P.O. Box 9443
Courtenay Place, **WELLINGTON 3**
Tel: 877-199
Cable: HEWPACK Wellington
CH,CS,CM,E,P

Northrop Instruments & Systems Ltd.
369 Khyber Pass Road
P.O. Box 8602
AUCKLAND
Tel: 794-091
Telex: 60605
A,M

Northrop Instruments & Systems Ltd.
110 Mandeville St.
P.O. Box 8388
CHRISTCHURCH
Tel: 488-873
Telex: 4203
A,M

Northrop Instruments & Systems Ltd.
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
WELLINGTON
Tel: 850-091
Telex: NZ 3380
A,M

NORTHERN IRELAND

See United Kingdom

NORWAY

Hewlett-Packard Norge A/S
Folke Bernadottes vei 50
P.O. Box 3558
N-5033 **FYLLINGSDALEN** (Bergen)
Tel: 0047/5/16 55 40
Telex: 16621 hpnas n
CH,CS,E,M

Hewlett-Packard Norge A/S
UCOsterndalen 16-18
P.O. Box 34
N-1345 **OCUSTERÅS**
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Telex: 16621 hpnas n
A,CH,CM,CS,E,M,P

OMAN

Khimjil Ramdas
P.O. Box 19
MUSCAT
Tel: 722225, 745601
Telex: 3289 BROKER MB MUSCAT
P

Suhail & Saud Bahwan
P.O.Box 169
MUSCAT
Tel: 734 201-3
Telex: 3274 BAHWAN MB
E

Imtac LLC
P.O. Box 8676
MUTRAH
Tel: 601695
Telex: 5741 Tawoos On
A,C,M

PAKISTAN

Mushko & Company Ltd.
House No. 16, Street No. 16
Sector F-6/3
ISLAMABAD
Tel: 824545
Cable: FEMUS Islamabad
*A,E,M,P**

Mushko & Company Ltd.
Oosman Chambers
Abdullah Haroon Road
KARACHI *0302*
Tel: 524131, 524132
Telex: 2894 MUSKO PK
Cable: COOPERATOR Karachi
*A,E,M,P**

PANAMA

ElectrOnico Balboa, S.A.
Calle Samuel Lewis, Ed. Alfa
Apartado 4929
PANAMA *5*
Tel: 63-6613, 63-6748
Telex: 3483 ELECTRON PG
A,CM,E,M,P

PERU

Cía Electro Médica S.A.
Los Flamencos 145, San Isidro
Casilla 1030
LIMA *1*
Tel: 41-4325, 41-3703
Telex: Pub. Booth 25306
CM,E,M,P

SAMS
Rio De La Plata 305
SAN ISIDRO
Tel: 419928
Telex: 394 20450 PELIBERTAD
P

PHILIPPINES

The Online Advanced Systems Corporation
Rico House, Amorsolo Cor. Herrera Street
Legaspi Village, Makati
P.O. Box 1510
Metro **MANILA**
Tel: 815-38-11 (up to 16)
Telex: 63274 Online PN
A,CH,CS,E,M

Electronic Specialists and Proponents Inc.
690-B Epifanio de los Santos Avenue
Cubao, **QUEZON CITY**
P.O. Box 2649 Manila
Tel: 98-96-81, 98-96-82, 98-96-83
Telex: 40018, 42000 ITT GLOBE MAC-KAY BOOTH
P

PORTUGAL

Mundinter
Intercambio Mundial de ComAErcio S.A.R.L.
P.O. Box 2761
Av. Antonio Augusto de Aguiar 138
*P-***LISBON**
Tel: (19) 53-21-31, 53-21-37
Telex: 16691 munter p
M

Soquimica
Av. da Liberdade, 220-2
1298 **LISBOA** *Codex*
Tel: 56 21 81/2/3
Telex: 13316 SABASA
P

Telectra-Empresa Técnica de Equipmentos Eléctricos S.A.R.L.
Rua Rodrigo da Fonseca 103
P.O. Box 2531
*P-***LISBON** *1*
Tel: (19) 68-60-72
Telex: 12598
CM,E

Rarcentro Ltda
R. Costa Cabral 575
4200 **PORTO**
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CH,CS

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HATO REY, Puerto Rico 00918
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A,CH,CS,CM,M,E,P

QATAR

Computer Arabia
P.O. Box 2750
DOHA
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P

Nasser Trading & Contracting
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DOHA
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M

SAUDI ARABIA

Modern Electronic Establishment
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CH,CS,E,M

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P

SCOTLAND

See United Kingdom

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A,CH,CS,E,MS,P

Dynamar International Ltd.
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SINGAPORE *1334*
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CM

SOUTH AFRICA

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CH,CM

Hewlett-Packard So Africa (Pty.) Ltd.
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CH

Hewlett-Packard So Africa (Pty.) Ltd.
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PRETORIA 0105
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CH,E

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A,CH,CS,E,M,P

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